

What is claimed is:

1. A complex membrane for an electrochemical device, comprising:
a micro-porous polyolefin membrane; and
5 a web-phase porous membrane united to at least one side of the micro-porous polyolefin membrane and composed of nano-fibers.
2. The complex membrane according to claim 1,
wherein the micro-porous polyolefin membrane is a membrane having at least
10 one layer composed of polyethylene polymer and/or polyethylene polymer.
3. The complex membrane according to claim 1,
wherein the micro-porous polyolefin membrane has a thickness of 5 to 50 μm
and a porosity of 30 to 80%.
- 15 4. The complex membrane according to claim 1,
wherein the nano-fiber has a diameter of 50 to 2,000 nm.
5. The complex membrane according to any of claims 1 to 4,
20 wherein the nano-fiber is made of polymer selected from the group consisting of
poly(vinylidene fluoride) (PVDF), poly(vinylidene)-co-(hexafluoropropylene)
[P(VDF-HFP)], poly(acrylonitrile) (PAN), poly(vinylidene)-co-(acrylonitrile)
[P(VDF-AN)] copolymer, poly(ethylene oxide) (PEO), poly(urethane) (PU),

poly(methylacrylate), poly(methyl methacrylate) (PMMA), poly(acrylamide) (PAA), poly(vinyl chloride) (PVC), poly(vinylacetate) (PVAc), poly(vinylpyrrolidone), polytetraethylene glycol diacrylate, poly(ethylene glycol dimethacrylate (PEGDMA), cellulose, cellulose acetate, and their mixtures.

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6. The complex membrane according to claim 1,

wherein the web-phase porous membrane has a thickness of 50 μm or below and a porosity of 60 to 95%.

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7. The complex membrane according to any of claims 1 to 6,

wherein the web-phase porous membrane contains a filler selected from the group consisting of SiO_2 , TiO_2 , Al_2O_3 , BaTiO_3 , LiO_2 , LiF , LiOH , LiN , BaO , Na_2O , MgO , Li_2CO_3 , LiAlO_3 , PTFE, and their mixture.

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8. A method for manufacturing the complex membrane for an electrochemical device, defined in the claim 1, comprising:

(a) preparing a micro-porous polyolefin membrane;

(b) laminating a web-phase porous membrane made of nano-fibers on at least one side of the micro-porous polyolefin membrane; and

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(c) uniting the micro-porous polyolefin membrane with the web-phase porous membrane by applying predetermined pressure and temperature to the result of the step (b).

9. The method for manufacturing the complex membrane according to claim 8,

wherein, in the step (b), the web-phase porous membrane made of nano-fibers is laminated on one surface of the micro-porous membrane by directly spinning a polymer
5 solution by means of electrospinning.

10. An electrochemical device, comprising:

an electrode structure for an electrochemical device composed of anode, cathode and the complex membrane, defined in the claim 1, interposed between the anode and
10 the cathode; and

an organic electrolyte moistened in the electrode structure.